

Efficacy of Jobst Compression Garments to Prevent Orthostatic Intolerance for up to Three Days following 14 Days of Bed Rest

Completed Technology Project (2010 - 2012)



Project Introduction

Aims: 1. To determine whether subjects wearing breast-high, graded compression garments become orthostatically intolerant after 14 days of head-down tilt bed rest (Groups 1 and 2). Measures of efficacy will be presyncope-free survival to 80° head-up tilt testing and responses in blood pressure, heart rate, stroke volume, and cardiac output. 2. To determine the time course of cardiovascular readaptation during the first three days of post-bed rest (BR) recovery after using compression garments for a short period of time on BR+0 (Group 1). The brief usage of high compression garments on BR+0 models the use of the anti-G suit (AGS) among Space Shuttle crewmembers. Readaptation will be measured by responses of blood pressure, heart rate, stroke volume, cardiac output, and presyncope-free survival time to 15-minute head-up tilt tests on BR+1 and BR+3 as well as measures of plasma volume each day of recovery. 3. To determine the effect of wearing graded compression garments on the time course of cardiovascular readaptation during the first three days of post-bed rest recovery (Group 2). Readaptation will be measured by responses of blood pressure, heart rate, stroke volume, cardiac output, and presyncope-free survival time to 15-minute head-up tilt tests on BR+1 and BR+3 as well as measures of plasma volume each day of recovery.

Anticipated Benefits

Findings from this study have the potential to impact treatment of patients who are hypotensive and/or suffer from episodes of orthostatic intolerance. Commercially-available knee-high and thigh-high compression garments, while easy to don and convenient to wear, have limited effectiveness as previously tested in our laboratory. The commercially-available breast-high garment, while an effective protection against orthostatic intolerance, can be difficult to don, uncomfortable, and/or inconvenient to remove to urinate or defecate. In contrast, the three-piece garment developed for this project provides the same amount of coverage as the commercially-available breast-high garment but provides greater levels of compression than the commercially-available breast-high garment, is an effective countermeasure to orthostatic intolerance, is easy to don and doff, and can be more easily adjusted for comfort. The improvements to the wear and comfort realized in the development of the three-piece garments should enhance compliance with long-term wearing of compression garments, reduce hypotensive episodes, and improve the lifestyle of patients with orthostatic intolerance. A cardiologist who treats these types of patients has complimented the investigator team on the design of the test garment, and the manufacturer of the modified garment has applied for a US patent.



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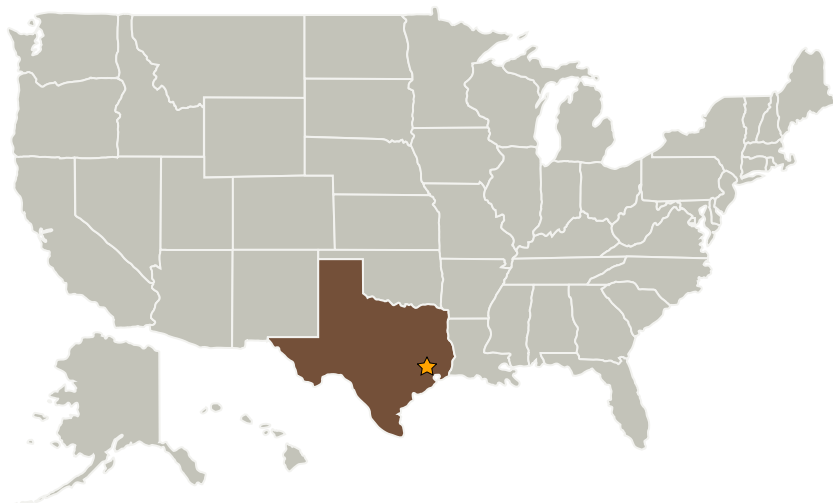
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations

Texas

Project Transitions

**October 2010:** Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Operations Mission Directorate (SOMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Human Spaceflight Capabilities

Project Management

Program Director:

David K Baumann

Project Manager:

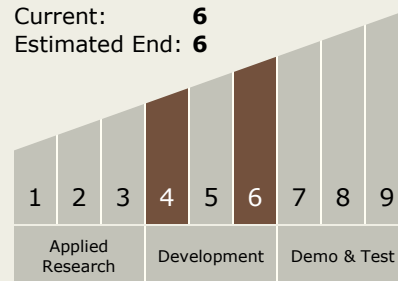
Peter Norsk

Principal Investigator:

Michael B Stenger

Technology Maturity (TRL)

Start: 4
Current: 6
Estimated End: 6



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✓ October 2012: Closed out

Closeout Summary: This project was completed with a total of 16 volunteers, 8 control subjects (Group 1), and 8 treatment subjects (Group 2). Data analysis was completed, and a manuscript has been submitted for consideration of publication in a peer-reviewed scientific journal. Results from this work indicate that wearing the abdomen-high compression garments during an 80-degree head-up tilt test (Groups 1 and 2) prevented the orthostatic intolerance that is normally present after BR. Thigh-high garments (Group 2) provided some protection after BR, and wearing these garments did not impair recovery as measured by a tilt test three days after bed rest. (Ed. note: updated report provided by PI August 2013.)

Stories

Abstracts for Journals and Proceedings
(<https://techport.nasa.gov/file/8460>)

Articles in Peer-reviewed Journals
(<https://techport.nasa.gov/file/8459>)

Project Website:

<https://taskbook.nasaprs.com>

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
 - └ TX06.3 Human Health and Performance
 - └ TX06.3.2 Prevention and Countermeasures

Target Destinations

The Moon, Mars